MECH 472: Thermal Systems Design

Fall 2018 Syllabus (Subject to Change)

Instructor: Laura Schaefer, MEB 106, x3836, las14@rice.edu

Class Hours: TR, 8-9:15 am, DCH 1064 (3 credits), with meetings in Duncan Symonds II on 9/6, 9/11, 9/20, 11/1, 11/15 (computer lab times may shift during the semester; this will be updated on the course web page)

Office Hours: TR, 2-3 pm, and by appointment (subject to adjustment after beginning of semester)

TAs: Tim Petrosius, Danielle Perdue, Victoria Granja Oramas, Kenechi Agbim, Ricardo Poveda Calderon, MEB 112, Office hours TBA

Objectives: This course will provide students with the tools to analyze and design energy systems.

Outcomes: At the conclusion of this course, students should be able to integrate material from the basic courses in thermodynamics, fluid mechanics, and heat transfer into the design of various thermal systems; gain experience in using computer techniques in modeling and simulating typical thermal systems; perform economic calculations involving time and interest; and be familiar with the environmental impact of energy systems.

Textbook: There is **NO** required textbook. One **recommended** textbook is Design of Fluid Thermal Systems, 4th ed., by Janna (earlier editions are also fine). Some other **optional** textbooks include Design of Thermal Systems by Stoecker, and Thermal Design and Optimization by Bejan, Tsatsaronis & Moran. Additionally, you should have access to the texts used in your **Thermodynamics**, **Fluids**, and **Heat Transfer** courses. I will also post notes from various textbooks/sources on the web page and I have put a few books on reserve.

Requirement: By 8/30, you are required to turn in one blank USB memory stick with a capacity of at least 512 MB. These memory sticks will be returned to you at the end of the semester (write your name on it if you want your specific one back). If you want to go in on these with your classmates, Amazon sells packs of 10 for ~$25, fyi.

Grading[1]**:**

Project Part 1 Report (9/28) - 20%	Two Exams (10/11 & Finals[2]) - 10% each
Project Part 2 Report (11/27[3]) - 35%	Subject Presentation (9/25, 9/27) - 5%
Project Presentation (11/27, 11/29) - 5%	Policy Presentation (11/8, 11/13) - 5%
	Homework - 10 %

For all graded assignments, clarity in logic and in presentation is crucial.

Project: The cornerstone of this class is group design project, broken into two parts. Groups will consist of 5-6 students (there will be 2 groups of 6), and the same group will complete both parts of the project. Teams must submit their members by the end of class on Aug. 28. There will be two graded reports, and a graded final, cumulative presentation. Group participation and contributions will be a factor in your grade for the design project.

Presentations: In addition to design project groups, groups of two students will do two short presentations (3-4 minutes, **max**) during the class. The first presentation will focus on an engineering subject, such as pipes, pumps, heat exchangers, or energy conversion technologies (a list of potential topics will be posted on Canvas). The second presentation will be a policy recommendation focused on an existing or theoretical alternative energy

[1] All dates are tentative.

[2] We will discuss the timing of this exam in the second half of the semester.

[3] Notice that Thanksgiving is on 11/23 – this deadline is the first class after returning from break. Think about this when you draw up your team's work schedule for the semester!

technology (an example will be posted on Canvas). Pairs must submit their set of members by the end of class on Aug. 28.

Homework: Late homework will not be accepted. Homework is due at the beginning of class (with a 10 minute tardy window). Not necessarily every HW problem will be graded.

Attendance: There is no explicit numerical penalty for missing class. However, in previous iterations of this course, I have observed a strong correlation between attendance and homework grades (and the resulting performance on exams).

Honor Code: Exams require the honor code statement and signature. Homework should be your own work, but studying and discussing the problems with others is permissible. Project work should be the group's effort. It is acceptable to discuss your project with others, but the work submitted must be that of **only your group**.

ADA Notice: If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Support Services (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

Course Topics:

1. Introduction, Review of the Basic Equations, Energy Overview (Course Policy, Simulation, etc.)
2. Heat Transfer (Heat Loads, Heat Exchanger Evaluation and Physical Design Specifications)
3. Piping Systems and Pumps (Flow Calcs and Networks, Pump Types and Performance)
4. Alternative Energy Systems (Geothermal, Solar, etc.)
5. Engineering Economics (Present/Future Worth, Investments)
6. Other Considerations (Environment, Ethics, etc.)
7. Other Topics as time permits (but realistically never does)

The above topics are subject to change based on the pace of the class and class dynamics.

Additional Information:

This is an election year. Some important dates are:

Last Day to Register to Vote in Texas: Tuesday, October 9, 2018

First Day of Early Voting: Monday, October 22, 2018

Last Day of Early Voting: Friday, November 2, 2018

Election Day: Tuesday, November 6, 2018